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## GEOLOGY.

**The Yellowstone National Park.**[1] — The final results of detailed geological investigation in the Yellowstone Park by Arnold Hague, geologist in charge of the survey, are to be published in a monograph consisting of several volumes. Part II of the series has been issued, containing descriptive geology of portions of the area and special papers on petrography and paleontology; several of these, notably those chapters by Professor Iddings, have already been printed in abstract, or more fully in annual reports of the survey. The authors of the several chapters are: Arnold Hague on the Mesozoic ridges of the southern part of the park, J. P. Iddings and W. H. Weed on the Gallatin Mountains and the Tetons, Weed on the Snowy Range, Iddings on petrography, the rhyolites, and some description of portions of the Absaroka Range, C. D. Walcott and G. H. Girty on Paleozoic fossils, T. W. Stanton on Mesozoic fossils, and F. H. Knowlton on the fossil flora.

South of the park the Teton Range contains a nucleus of crystalline schists and gneisses overlain by flexed Paleozoic and Mesozoic strata; these were deeply eroded and covered by breccias and rhyolites, the latter forming vast flows, which constitute a large portion of the present Yellowstone plateau. In the Gallatin Mountains, northwest of the park, strata ranging from Cambrian to Cretaceous have been elevated, folded, and faulted, and at the close of the Laramie the rocks were invaded by dikes, sheets, and laccoliths of igneous rock. In comparing the rocks of Electric Peak and Sepulchre Mountain, the former coarsely crystalline and the latter volcanic, in close proximity, Iddings has determined that diorites may be chemically identical with andesites of different mineral composition. Like the Tetons, the Snowy Range, northeast of the park, has an archæan core bordered by sediments dipping toward the lavas.

In the southern part of the park a number of ridges of Cretaceous sandstone occur, with the rhyolites abutting against their upturned flanks. There are here several exposures of dacite or quartz-andesite, apparently older than the rhyolite. A sandstone near the base of Pinyon Peak contains Laramie plants; a conglomerate overlying the Laramie and beneath the earlier volcanics is here conspicuous and is believed to be of Eocene age.

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[1] Geology of the Yellowstone National Park, *Monograph XXXII*, *U. S. Geological Survey*, Pt. ii, Descriptive Geology, Petrography, and Paleontology, by Arnold Hague, J. P. Iddings, W. H. Weed, C. D. Walcott, G. H. Girty, T. W. Stanton, and F. H. Knowlton. xvii+791 pp., 121 plates. Washington, 1899.

An interesting physiographic feature described by Mr. Hague is the old outlet of Yellowstone Lake, which formerly drained off to the southward by way of Snake River, and sent its waters to the Pacific. The outflow was through Outlet Canyon, south of the lake, and this gorge was so obscured by forest and glacial drift that for many years it was not suspected as being so important a key to the physiography. It is described as a "broad, deep gorge, and throughout a long period of time evidently served as the channel for a rapid, powerful stream carrying a large volume of water. To-day its bottom is a flat, grassy meadow." . . . An old terminal moraine across the bottom of the canyon marks the course of the present continental divide. A mighty change was effected in late geologic times by the damming of the lake to the southward and its overflow through the decomposed rhyolite on the north, so that the whole vast basin was diverted to form Yellowstone River and drain to the Altantic. The Yellowstone canyon and falls are results of this natural accident.

Professor Knowlton's study of the fossil flora, largely collected from the Tertiary tuffs and breccias, is a valuable contribution to paleobotany. Many species new to science are described, and it is shown that the present flora of the park is wholly distinct from that of Tertiary time. "Climatic conditions must have greatly changed. . . . The climate during Tertiary time, as made out by the vegetation, was a temperate or subtemperate one, not unlike that of Virginia at the present time, and the presence of the numerous species of Ficus would indicate that it even bordered on subtropical."

The volume consists of 900 pages of heavy paper, exclusive of plates, and there are 121 plates, in part map folders and thick heliotypes. A book, 12 × 9 inches, of this thickness, is, to say the least, unwieldy, and it seems undesirable to bind together diverse material, by various authors, in such bulky tomes. The margins are unnecessarily wide, and a book of this sort is extremely difficult to handle, and absolutely useless for the geologist in the field. As all the chapters are distinct in authorship, and the sequence is of no especial significance, such a work might much better be bound in a number of smaller volumes by separate authors.

The microphotographs by Iddings are of unusual excellence, and most of the illustrations are good. The reconstruction of geologic cross-sections in the air (Pls. V, XXXII), for heights of 10,000 feet, is unwarranted by the facts cited or actual sections shown. Illustration of the descriptive geology would be improved with more diagrammatic figures in the text. There is a prejudice among scientists against text-figures in monographs ; it seems to the writer that brevity and precision are the first requirements of a modern scientific work, and sometimes a text-figure will save referring to a remote plate, or reading a page of otherwise obscure statement.

T. A. J., JR.

**Maryland Weather Service.**[1] — If the plans of the Maryland Weather Service and Geological Survey are carried out to a finish, that state will in a few years have the most complete record of natural resources ever made for a single area. The Weather Service proposes to investigate land forms, weather, water, climate, soil, forestry, crops, fauna, and flora; the Geological Survey is studying earth physics, rocks, and minerals. Both organizations are under the efficient management of Professor William Bullock Clark, supported by state funds and by a corps of scientific assistants picked from Johns Hopkins University.

The first volume of the Maryland Weather Service is issued in the same size and style as the Geological Survey, with lavish illustration in the form of maps, charts, half-tones, heliotypes, and colored plates. The colored cloud pictures of the Hydrographic Office are reproduced. In the introduction Professor Clark states the plan and organization of the service. Cleveland Abbe, Jr., has a chapter on the physiography of the state. Meteorology is treated by Cleveland Abbe, of the U. S. Weather Bureau, F. J. Walz, and O. L. Fassig. The same thorough reconnoissance of the field is shown in this volume as in the early volumes of the Geological Survey. Professor Abbe's chapter on Aims and Methods of Meteorological Work is a complete statement of modern methods of studying the weather, with illustrations of all the instruments used. Other chapters are historical, statistical, and bibliographical.

T. A. J., JR.

**Experimental Geology.**[2] — The course of public lectures given by M. Stanislas Meunier in the Natural History Museum of the Jardin des Plantes in 1898 has been published in a small volume in popular form. The work is divided into two parts ; the first deals with experimental imitation of surface processes in geology, denudation,

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[1] *Maryland Weather Service*, vol. i. Johns Hopkins Press, 1899.

[2] Meunier, Stanislas. *La géologie expérimentale.* Paris, 1899.